



Methane to Markets



Natural Gas STAR International

**Reducing Emissions
Increasing Efficiency
Maximizing Profits**

Presentation Outline

- Background: Methane to Markets
 - Oil and Natural Gas Methane Emissions
- Natural Gas STAR International
 - Program Overview
 - How to Join
 - Current International Partners
 - Key Resources Available
- Company Case Study Examples and Program Accomplishments

Background: Methane to Markets

- The **Methane to Markets Partnership** is an international initiative that advances cost-effective, near-term methane recovery and use as a clean energy source in four sectors:



Oil and Gas Systems



Coal Mines



Landfills



Agricultural Waste

- The goals of the Partnership are to reduce global methane emissions to:
 - Enhance economic growth
 - Strengthen energy security
 - Improve air quality and industrial safety
 - Reduce emissions of greenhouse gases

Methane to Markets Partner Countries

Currently, there are 27 Partner Governments in the Methane to Markets Partnership, including Russia and the U.S.

North America

Canada
Mexico
United States

South America

Argentina
Brazil
Colombia
Ecuador

Africa Nigeria

Europe

European Commission
Finland
Germany
Italy
Poland
Russia
Ukraine
United Kingdom

Asia Pacific

Australia
China
India
Japan
Kazakhstan
Korea
Mongolia
Pakistan
Philippines
Thailand
Vietnam

Why Focus on Methane?

- **A potent greenhouse gas (GHG) with 100-year global warming potential of 23; atmospheric lifetime of ~12 years**
- **The 2nd most important GHG accounting for ~16% of total climate forcing**
- **A primary component of natural gas and a valuable, clean-burning energy source**
 - Proven, viable technologies and practices exist to reduce methane emissions cost-effectively
- **Oil and natural gas operations are a significant source (18%) of total global human-made methane emissions.**
 - EPA estimates that methane emissions are projected to grow globally by more than 33% from 2005 to 2015.

Natural Gas STAR International

Under the Methane to Markets framework, EPA launched Natural Gas STAR International in 2006:

- Builds on the success of the domestic Natural Gas STAR Program.
- Creates a framework for global application of the Program's principles.
- Increases opportunities to reduce methane emissions from oil and gas operations worldwide.



James Connaughton, Chairman, White House Council on Environmental Quality speaking before the signing ceremony for the seven Natural Gas STAR International charter members

International Partners

- To date, nine companies have joined Natural Gas STAR International



How Do Companies Participate?

- **Joining Natural Gas STAR International involves:**
 - Signing a voluntary one page Memorandum of Understanding;
 - Evaluating and implementing current and future voluntary activities that reduce methane emissions;
 - Submit an Implementation Plan within one year of joining and report activities to EPA on an annual basis.

- **Benefits include:**
 - Partner companies are automatically eligible for all of the services Natural Gas STAR has available
 - Build a strong network with and learn from direct experience of others in the industry.
 - Flexible participation and reporting formats; companies can participate at the level they choose, evaluating company-wide, site-specific or pilot projects.

Natural Gas STAR Resources

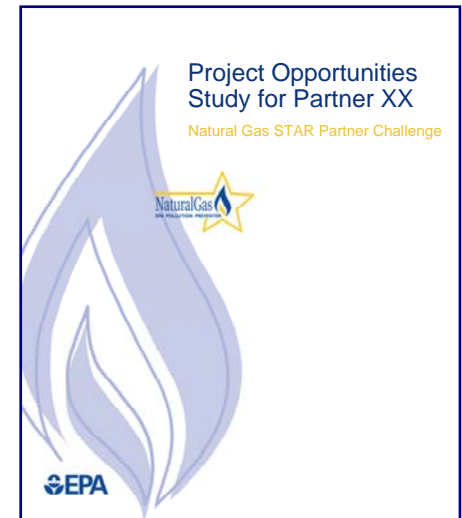
Resources to advance cost-effective oil & gas sector methane emission reductions:

- **General technology transfer, training, and capacity building:**
 - Technical documents and research outlining over 80 mitigation options, including analyses of economic, environmental and operational benefits
 - Workshops and Conferences
 - Study tours



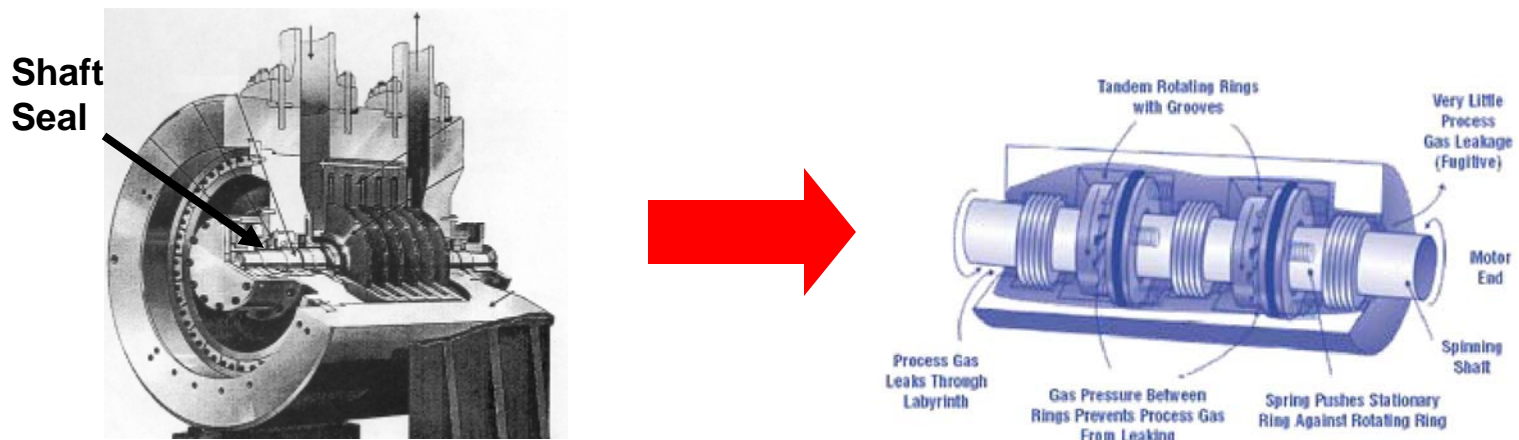
Natural Gas STAR Resources, cont.

- Individual technical assistance to help companies identify and assess cost-effective methane emission reduction opportunities
 - Analysis of estimated methane emission sources and corresponding project opportunities
 - Pre-feasibility and feasibility studies
 - Leak detection and measurement studies
- The following case studies provide examples of ways EPA has collaborated with international oil and gas companies to advance cost-effective methane emission reductions



Case Study 1: Pemex Mexico Centrifugal Compressors

- EPA helped PEMEX assess benefits of shifting from wet seals to dry seals on centrifugal compressors at a compression station in Southern Mexico
- Pre-feasibility study included:
 - Preliminary estimations of benefits
 - Measurements of methane emissions from wet seals
 - Adjusting of preliminary estimations
 - Basic project economics assessment
 - Final measurements to assess performance and benefits



Case Study 1: Pemex Benefits

- Confirmed reduction in gas savings
 - 33.5 SCFM (57 m³/h) per seal
 - 35 MMCF (1 million m³) per compressor per year
- Environmental and economic benefits:
 - Reduction of 7,310 Ton of CO₂ equivalent per year
 - US \$126,690 /year in natural gas commercial value
 - Additional revenue of US \$58,480 \$/year possible if presented for carbon credit
- There are at least 60 similar compressors in the PEMEX natural gas system, with a combined methane emissions reduction of 438,000 Ton of CO₂e /year

Economic benefits for operational costs (power, oil and cooling water) and maintenance are not included.

Case Study 2: ONGC Technology Transfer

- **ONGC, India's largest oil and gas producer, joined the Natural Gas STAR International in 2007 (first state-owned partner company)**
- **EPA and ONGC conducted a series of successful technology transfer workshops at four sites to promote methane mitigation opportunities (December 2007)**
- **Based on the success of the workshops:**
 - Conducted desktop prefeasibility analyses to estimate emissions sources at seven sites
 - EPA and ONGC conducted four onsite measurement studies to assess key methane emission sources and potential mitigation measures (May 2008)
 - Presented measurement study results and recommendations to ONGC Board of Directors (September 2008)



Case Study 3: KyrKazGas Leak Detection and Quantification

EPA, in partnership with the Asian Development Bank, conducted a project with KyrKazGas (of the Kyrgyz Republic) to perform leak detection and quantification of its natural gas transmission system.

- Current methane leak inspection and repair practices result in overlooked methane emissions and product loss.
- A field study in February, 2008 demonstrated state-of-the-art leak detection and measurement technologies and techniques and then used those to assess methane emissions, product loss, and operating practices.
- KyrKazGas gained technical training and experience in leak detection and quantification and ability to demonstrate the viability of capital investment in methane emission reduction projects.

Case Study 4: Analysis of Methane Recovery from Colombia Tank Battery

- EPA analyzed company-provided operational data to provide Columbia with recommendations for cost-effective methane mitigation
 - Two sources of wasted methane: methane from gas-liquid separator flared and methane from oil-water separator vented
 - Currently importing expensive diesel to supplement grid electricity

Preliminary proposal

- Install VRU to capture vented emissions
- Install compressor to increase gas condensate output and improve gas quality
- Install Reciprocating Engine/Generator to burn previously flared gas for electricity

Estimated Benefits

- Carbon emissions reduction of 283,000 m3 per year methane or 80,000 TCO2e per year
- 8 Mega Watts (MW) of power generated
- 14 months simple payback and 87% internal rate of return

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Natural Gas STAR International:
epa.gov/gasstar/international/index.html

Methane to Markets Partnership:
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